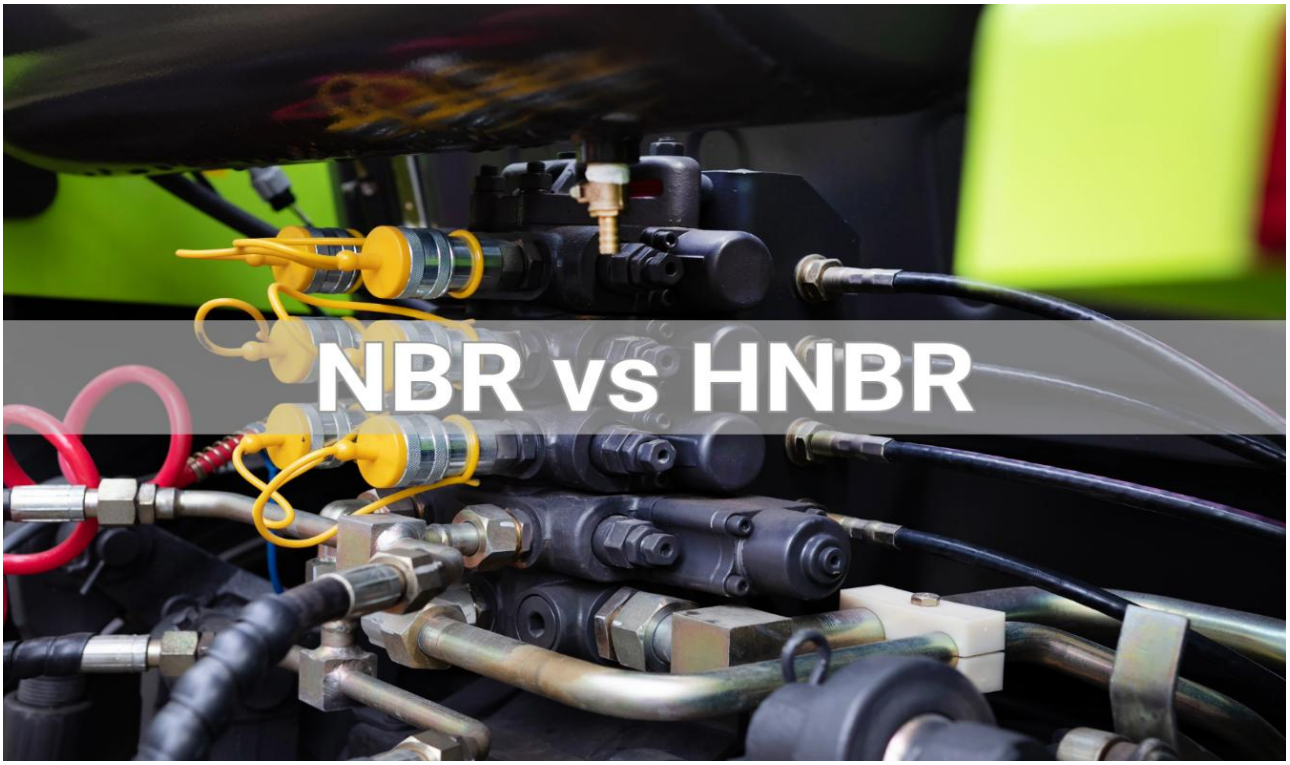

NBR Rubber vs HNBR Rubber

By: Manuel Valenzuela

NBR, or nitrile rubber, is the standard elastomer for sealing petroleum oils and fuels, valued for its oil resistance, strong physical properties, and cost efficiency. HNBR is a hydrogenated version of NBR that keeps the same oil resistance, while increasing the material's heat resistance, adding outdoor & ozone resistance, and improving physical performance.

Both materials are used for rubber gaskets, seals, O-rings, molded components, and extruded profiles in automotive, military, oil and gas, and industrial equipment. This guide compares the two and explains when the upgrade to HNBR is worth consideration.

What is NBR rubber?
NBR (nitrile butadiene rubber, also called Buna-N or nitrile), is a synthetic rubber copolymer of acrylonitrile and butadiene. It's one of the most widely used elastomers in industrial sealing because it resists petroleum oils, fuels, and greases, processes easily, and costs less than most oil resistant alternatives. NBR's main limitation is its poor resistance to ozone, sunlight, weathering and other factors present in outdoor applications.

What is HNBR?
HNBR is the hydrogenated version of NBR. Hydrogenating the polymer backbone significantly improves sour gas resistance, mechanical strength, widens the higher operating temperature range, and increases resistance to oxidation and ozone while retaining NBR's inherent fuel and

oil resistances.

HNBR Rubber's Advantages

-
- **Heat resistance.** HNBR rubber is generally rated up to +275°F to +300°F, compared with +220°F for most standard NBR grades.
- **Ozone and weather resistance.** HNBR was partially developed to overcome this weakness in NBR, which tends to crack with prolonged outdoor or ozone exposure.
- **Mechanical strength.** HNBR offers higher tensile strength, better tear and abrasion resistance, and excellent impact resistance.
- **Compression set and heat aging.** HNBR generally retains sealing force and physical properties for a longer time at elevated temperatures.

NBR Rubber's Advantages

- **Upfront Cost.** The NBR polymer is generally lower in cost, easier to process and more accessible than HNBR.
- **Availability.** As the first choice for many oil and gas applications, most rubber manufacturers are familiar with and can process NBR. Fewer manufacturers work with HNBR.
- **Field track record.** NBR has been in commercial production since the 1930s, while HNBR became commercially available in 1984. NBR provides engineers and quality teams with more documented service data to evaluate.

When They Are Comparable
Generally, any NBR application can be serviced with HNBR, but not the other way around. They have similar low temperature resistance and both share excellent chemical resistance properties - resisting greases, petroleum oils, and aliphatic hydrocarbons.

NBR & HNBR Comparison Table*

Attribute	Property	NBR	HNBR
General	Hardness (Shore A)	35 to 90	40 to 90
	Tensile Strength (psi)	1,000 psi to 2,500 psi	1,000 psi to 3,500 psi
	Elongation at Break (%)	100% to 500%	100% to 600%
	Temperature Range	-40°F to +220°F	−40°F to +300°F
	Cost	Lower	Higher
Mechanical	Compression Set	Good	Excellent
	Abrasion Resistance	Good	Excellent
	Impact Resistance	Fair to Good	Excellent
	Rebound Rating	Fair to Good	Good
	Tear Resistance	Fair to Good	Excellent
	Flex Cracking Resistance	Good	Good to Excellent
Exposures	Mineral Oil and Greases	Excellent	Excellent
	Fuel Resistance	Good to Excellent	Excellent
	Oil Resistance	Excellent	Excellent
	Hydraulic Fluids	Excellent	Excellent
	Weather Resistance	Poor to Fair	Excellent

*These are typical ranges across Nitrile and HNBR compounds. Actual performance and characteristics depend on the manufacturer's ability to formulate, and the specific compound selected for the application.

Choosing between NBR and HNBR
Evaluating the exposure, dynamic forces, and target costing for each application will provide you with a starting point on which material is best suited.

If the application is indoors, sees petroleum oils or fuels, does not see temperatures above +220°F, and upfront cost is critical, then NBR can be a viable material to consider.

If the part sees higher temperatures, ozone, weather exposure or has already failed in NBR from hardening or cracking, then HNBR would be worth evaluation.

WARCO's Nitrile and HNBR Rubber
WARCO compounds, mixes, tests, and manufactures both NBR and HNBR rubber. We produce each material as calendered sheet and rolls, molded sheets, extrusions, spliced seals and large O-rings, and custom molded parts. Send us your specifications, drawings, or other requirements

and our technical team will develop a solution for you. Request a quote by emailing sales@warco.com or calling (714) 532-3355.

Frequently Asked Questions about NBR and HNBR

1. **What's the difference between NBR, Nitrile, and Buna-N?**
   These are different names generally used to identify the same material. NBR (nitrile butadiene rubber) is the technical abbreviation, nitrile is the common name, and Buna-N is an older trade name derived from the original chemical make up.

2. **Why does HNBR cost more initially than NBR?**
   HNBR is generally more expensive than NBR due to the hydrogenation, availability, and processability. However, the specific cost can vary based upon the compound, form, and volume. Feel free to request a quote from WARCO for a direct comparison in your application.